



Fellmeth, G., Rose-Clarke, K., Zhao, C., Buser, L. K., Zheng, Y., Massazza, A., Sonmez, H., Eder, B., Blewitt, A., Lertgrai, W., Orcutt, M., Ricci, K., Mohamed-Ahmed, O., Burns, R., Knipe, D., Hargreaves, S., Hesketh, T., Opondo, C., & Devakumar, D. (2018). Health impacts of parental migration on left-behind children and adolescents: a systematic review and meta-analysis. *Lancet*, 392(10164), 2567-2582. [10164]. [https://doi.org/10.1016/S0140-6736\(18\)32558-3](https://doi.org/10.1016/S0140-6736(18)32558-3)

Peer reviewed version

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[10.1016/S0140-6736\(18\)32558-3](https://doi.org/10.1016/S0140-6736(18)32558-3)

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This is the author accepted manuscript (AAM). The final published version (version of record) is available online via Elsevier at [https://doi.org/10.1016/S0140-6736\(18\)32558-3](https://doi.org/10.1016/S0140-6736(18)32558-3). Please refer to any applicable terms of use of the publisher.

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Health impacts of parental migration on left-behind children and adolescents: a systematic review and meta-analysis

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SUMMARY (300/300)

Background: Globally, a growing number of children and adolescents are left-behind when parents migrate. We investigated the effect of parental migration on left-behind child and adolescent health in low- and middle-income countries (LMICs).

Methods: We systematically reviewed observational studies investigating effects of parental migration on nutrition, mental health, unintentional injuries, infectious disease, substance use, unprotected sex, early pregnancy and abuse among left-behind children aged 0-19 years in LMICs. We searched databases including MEDLINE, EMBASE and CINAHL from inception to 27 April 2017, without language restrictions. We used meta-analyses to pool findings, and subgroup analyses and meta-regression to investigate heterogeneity. A revised version of the Newcastle-Ottawa tool was used to assess bias. The protocol was registered with PROSPERO (CRD42017064871).

Findings: 111 studies were included with outcomes for 264,967 children. 91 studies were conducted in China and focused on effects of internal labour migration. Compared to children of non-migrants, left-behind children had increased risk of depression and higher depression scores (risk ratio (RR) 1.52 [95% confidence interval 1.27-1.82]; standardised mean

difference (SMD) 0.16 [0.10-0.21]), anxiety (RR 1.85 [1.36-2.53]); SMD 0.18 [0.11-0.26]), suicidal ideation (RR 1.70 [1.28-2.26]), conduct disorder (SMD 0.16 [0.04-0.28]), substance use (RR 1.24 [1.00-1.52]), wasting (RR 1.13 [1.02-1.24]) and stunting (RR 1.12 [1.00-1.26]). We found no difference for other nutrition outcomes, unintentional injury, abuse or diarrhoea. No studies reported outcomes for other infectious diseases, self-harm, unprotected sex or early pregnancy.

Interpretation: Parental migration is detrimental to left-behind child and adolescent health, with no evidence of any benefit, and the strongest evidence for China. Action is needed by policy-makers and healthcare professionals to improve the health of these young people.

Funding: Wellcome Trust (209993/Z/17/Z)

Research in context

Evidence before this study: As migration increases globally, there are a growing number of children and adolescents who are often left behind when their parents migrate. Before starting this study, we searched the scientific literature and found two narrative reviews: one focused on left-behind children in the Philippines and the other on mental health outcomes in left-behind children in China. These reviews suggested that children benefited from the remittances their parents sent home in terms of improved education and reduced child labour - which could result in improved health - but that family separation may have long-term psychological and societal costs. We found no systematic literature search examining the effects of parental migration across different country settings on a broad range of health outcomes.

Added value of this study: This is the largest and most comprehensive study to date assessing the impact of parental migration on all key areas of child and adolescent health across all low- and middle-income country (LMICs) settings. Compared to children of non-migrants, left-behind children and adolescents had a 52% increased risk of depression, 70% increased risk of suicidal ideation and 85% increased risk of anxiety. Smaller increases in risk were found

for wasting (13%), stunting (12%) and substance use (24%). This sheds new light on a rarely discussed consequence of global migration with implications for global policy making as well as healthcare provision in migrant-sending countries. Whilst a small number of individual studies found positive health effects of parental migration, overall, we found no evidence of benefit across any of the health outcomes we explored.

Implications of all the available evidence: Findings present a clear picture of the unmet health needs of left-behind children and adolescents. Research to date focuses primarily on China and longitudinal studies in a wider range of LMICs with high rates of emigration are needed to better understand risk and resilience factors within this population, and to inform policy and practice to address unmet health needs in left-behind children, adolescents and their carers.

INTRODUCTION

Globally, nearly one in seven people are migrants. The majority are labour migrants who originate from low- or middle-income countries (LMICs) and move in search of employment opportunities either internationally or internally within a country's borders - for example from rural to urban settings.¹ Others experience 'forced' migration as a result of more acute drivers such as conflict and disasters. For some forms of migration, especially low-skilled labour migration, children are often left behind in the care of other family members or carers.

Among labour migrants, a key incentive for migration is the hope of improving life circumstances of families and children through increased household incomes and financial stability. It is estimated that international migrants send US\$613 billion per year in remittances to their countries of origin.² Although there has been renewed interest in the health and rights of migrant workers in recent years - now a priority issue in the United Nations' Sustainable Development Goals³ - the health children of migrants has been largely overlooked in research and policy.

Although there is no estimate for the number of left-behind children and adolescents globally, the figure is likely to be in the hundreds of millions. More than a third of all children in China (61 million) are left-behind by one or both migrant parents.⁴ Estimates from other countries suggest a prevalence of left-behind children of 27% in the Philippines,⁵ 36% in Ecuador⁶ and over 40% in rural South Africa.⁷

The evidence on the health status of left-behind children is mixed. On the one hand, one might expect material benefits and greater income security from remittances to confer improvements in health and facilitate access to healthcare and education. In Pakistan, for example, migration had positive effects on the growth of left-behind children, with girls benefitting more than boys.⁸ However, other data suggests poorer health outcomes among left-behind children. In China, where most research to date has been conducted, studies have shown poorer nutritional,⁹ developmental¹⁰ and mental health outcomes¹¹ in left-behind children compared with children of non-migrant parents. It is unclear to what extent the health of these children is impacted by parental migration, and how the impact might vary according to contextual factors including children's sex and age. For example, in China, boys who were left before the age of six were not as tall as boys whose parents left them at an older age.¹² While adolescents may be more independent than younger children, parental absence and lack of supervision at this critical age has been associated with risk-taking behaviours including substance use and physical inactivity, with implications for long-term health.¹³ Furthermore, effects may vary according to the circumstances of parental migration. For example, maternal absence and the absence of both parents may have more pronounced effects on children's health than paternal absence alone.¹⁴ To date, no studies have comprehensively examined the health status of left-behind children and adolescents across all settings and key areas of health. To address this research gap, we conducted a systematic review and meta-analysis to examine the impact of parental migration on child and adolescent nutrition, mental health, unintentional injuries, infectious disease, substance use, unprotected sex, early pregnancy and verbal, physical, and sexual abuse in LMICs. We explored whether parental migration status (one or both parent migrating), type of migration (internal or

international; labour or forced) and child characteristics (age; sex) differentially influence the health of left-behind children and adolescents.

METHODS

Search strategy and selection criteria

The study conforms to the Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA) guidelines¹⁵ (**Appendix p 2**). We included observational studies conducted in LMICs as classified by the World Bank¹⁶ that reported on children and adolescents aged 0-19 years with at least one migrant parent. We defined parental migration as one or more parent moving away from the place where their children are living, for a minimum of six months. We included studies where parents had migrated for any reason, for example for employment (labour migrants) or due to armed conflict or disasters (forced migrants). We included internal and international parental migration, defined as migration within and beyond a country's borders, respectively. The comparator group was children of non-migrating parents. Outcomes were the ten main causes of disability-adjusted life years for the under-5, 5-9 and 10-19 year age groups including nutrition (stunting, wasting, underweight, overweight and obesity, low birthweight and anaemia), mental health (depressive disorder, anxiety disorder, conduct disorders, self-harm and suicide), unintentional injuries and infectious disease outcomes. The following key determinants of health were also included: substance use, unprotected sex, early pregnancy (<18 years) and physical, emotional and sexual abuse¹⁷ (**Appendix p 5**). We excluded studies where less than 50% of participants were aged 0-19 years, the mean or median age was more than 19 years, fewer than 50% of parents had migrated for over six months, or the mean or median duration of migration was less than six months.

We searched MEDLINE, EMBASE, CINAHL, the Cochrane Library, Web of Science, PsychINFO, Global Index Medicus, Scopus and Popline from inception to 27th April 2017. We then updated searches to 5 September 2018 to assess whether more recent studies may alter the implications of our findings. We tailored search strategies to each database and used

controlled vocabulary and search filters where available, or Boolean search methods and free text terms. No restrictions were applied on the basis of language or publication date. Due to the large volume of research on left-behind children in China, we searched the China National Knowledge Infrastructure and key Chinese public health journals. We also searched reference lists of relevant systematic reviews and grey literature by key international organisations (e.g. United Nations Children's Fund, International Organization for Migration and United Nations High Commission for Refugees). The full search strategy is detailed in the **Appendix p 6**. We used Covidence systematic review software (Veritas Health Innovation, Melbourne) to organise and screen articles. Two reviewers independently screened each title and abstract and excluded those that were not relevant. Next, two reviewers independently screened the full text of remaining studies to assess eligibility and conducted data extraction and risk of bias assessment for all included studies. We extracted data on study design, participant numbers and characteristics, exposures and outcomes using data extraction sheets designed by the authors (**Appendix p 8**). Risk of bias was assessed using an adapted version of the Newcastle Ottawa Scale¹⁸ incorporating items from the National Institute for Clinical Excellence (NICE) Quality Appraisal¹⁹ (**Appendix p 16**). Studies with a high or unclear risk of bias across five or more domains were defined as being at high risk of bias. This definition was based on consensus between the authors while acknowledging that any such cut-offs are arbitrary.²⁰ No studies were excluded on the basis of quality. Discrepancies in data extraction or risk of bias scores were resolved through discussion with a third reviewer or by contacting study authors. Studies that reported results as mean scores with standard deviations or as raw proportions or unadjusted odds ratios were included in meta-analysis. When insufficient data were reported for inclusion in the meta-analysis, we contacted study authors to request further information. The study protocol was registered in the Prospero database (CRD42017064871).

Data synthesis and analysis

We also summarised outcomes from all studies included in the review diagrammatically, using adjusted estimates to classify studies according to their effect estimates and provide a

visual overview of the evidence. Random effects meta-analysis was conducted on those studies with sufficient data to examine the effect of being left-behind on nutrition outcomes, mental health, injury and substance use. We estimated pooled risk ratios (RR) with 95% confidence intervals (95% CI) for binary outcomes and standardised mean differences (SMD) with 95% CI for continuous outcomes. Binary categorisations indicate the presence or absence of a disorder (caseness), and continuous outcomes relate to the number of symptoms. We used unadjusted study outcomes for three main reasons. First, only fifteen studies reported adjusted effect estimates. Second, among those adjusted effects there was wide variation with regards to the covariates included and effects were not directly comparable. Third, a number of studies reported adjusted odds ratios; with the ‘non-collapsibility’ property of odds ratios,²¹ estimates from such adjusted odds ratios can differ significantly from unadjusted estimates even in the absence of confounding. We used meta-regression to assess the effect of child age and sex on study-specific effect estimates. We used the I^2 statistic to represent the proportion of total variation between study estimates that was due to heterogeneity.²⁰ To address sources of heterogeneity, we planned *a-priori* subgroup analyses by internal vs. international migration, one vs. both parent migration and forced vs. labour migration. As a sensitivity analysis to check the robustness of our conclusions to the assumptions underlying our analytic approach we conducted fixed effects meta-analyses and repeated analyses using only studies with low risk of bias. Funnel plots were used to assess for evidence of publication bias. Analyses were conducted in *Stata 13*²² and *MetaXL*.²³

Role of the funding source

The study was funded by the Wellcome Trust (209993/Z/17/Z). The funder had no role in study design, data collection, data analysis, data interpretation, writing of the report or the decision to submit. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

RESULTS

Search results and study characteristics

We found 10,284 articles, of which 2265 were duplicates (**Figure 1**). Of the 396 full-text articles retrieved, 111 (including 106,167 left-behind children and adolescents and 158,800 children and adolescents of non-migrant parents) were included in the systematic review^{9,10,13,24-131} and of these 89 (including 78,273 left-behind children and adolescents and 88,350 children of non-migrant parents) were included in meta-analyses. Reasons for exclusion at the full-text screening stage are reported in the **Appendix p17**. **Table 1** presents the characteristics of included studies. Studies were conducted between 1994–2017 across sixteen countries. The majority were carried out in China (91/111; 82.0%) and published in Chinese (58/111; 52.3%) with the remainder carried out in Asia (n=9), Latin America (n=6), Africa (n=3), the Caribbean (n=2) and Eastern Europe (n=2). The majority (n=101) of studies were cross-sectional; remaining studies were cohort (n=7) and case-control (n=3) studies. All studies included children of labour migrants; none included children of forced migrants. All Chinese studies examined internal migration within China, while studies from the rest of the world focused mainly on international migration. Seventy-one studies included children aged under ten years. Among the 92 studies which reported participant gender, the proportion of male participants ranged from 13.1% to 76.3%. Study quality varied by domain assessed (**Table 2**). 43.2% (48/111) of included studies were at high or unclear risk of bias across five or more domains. Funnel plots showed no evidence of publication bias (**Appendix p43**).

Key health outcomes

Figure 2 provides a diagrammatic overview of findings from all 111 studies included in the review. Mental disorders were the most common study outcome (n=64), followed by nutritional status (n=29), substance use (n=14), experience of violence and abuse (n=7), unintentional injury (n=6) and infectious disease (n=5). Across all outcomes, only 12 studies reported a lower risk of adverse health outcomes among left-behind children and adolescents.

Mental health

All but one of the studies reporting mental health outcomes used self-reported screening tools. Results from the meta-analysis show that left-behind children and adolescents had a significantly higher risk of depression caseness and symptoms (RR 1.52 (95% CI 1.27-1.82); SMD 0.16 [95% CI 0.10-0.21]), anxiety caseness and symptoms (RR 1.85 (95% CI 1.36-2.53); SMD 0.18 (95% CI 0.11-0.26)) and suicidal ideation (RR 1.70 (95% CI 1.28-2.26)) compared with children of non-migrating parents (**Figures 3a and 3b**). Left-behind children and adolescents had a higher risk of symptoms of conduct disorder (SMD 0.16 (95% CI 0.04-0.28)) but not caseness (RR 1.16 (95% CI 0.88-1.52)). Statistical heterogeneity across mental disorder outcomes was high with I^2 estimates ranging between 67.0-96.9%. In subgroup analyses, there was no difference in risk of anxiety caseness or symptoms among children and adolescents left-behind by one parent or by both parents compared with non-migrant parents. Depression caseness remained higher among children and adolescents left-behind by one and by both parents. We found a higher risk of depression symptoms among children and adolescents left-behind by both parents compared to those of non-migrants, but not between those left behind by one parent compared to those of non-migrants. No significant differences in risk of mental disorders were found among children and adolescents of international migrants compared with children of non-migrant parents. Aside from conduct disorders, the number of studies was limited. Among children of internal migrants (all of whom were in China) risks remained the same as for the main analyses (**Appendix p43**). Excluding studies at high risk of bias did not alter mental disorder outcomes. Using a fixed-effects model did not significantly alter effect estimates with the exception of conduct disorders, for which statistical evidence of a difference was observed for binary outcomes (RR 1.45 (95% CI 1.38-1.52) (**Appendix p59**)). We did not include any studies in the meta-analysis reporting outcomes for self-harm.

Nutrition outcomes

Meta-analyses found that left-behind children had a significantly increased risk of wasting (RR 1.13 (95% CI 1.02-1.24)) and stunting (RR 1.12 (95% CI 1.00-1.26)). We found no

evidence of differences in mean height-for-age (SMD -0.47 (95% CI -0.95-0.01)), mean weight-for-height (SMD -0.02 (95% CI -0.09-0.05)), mean weight-for-age (SMD -0.32 (95% CI -0.69-0.05)), underweight (RR 1.10 (95% CI 0.88-1.38)), overweight or obesity (RR 0.94 (95% CI 0.74-1.19)), or iron-deficiency anaemia (RR 1.18 (95% CI 0.91-1.54)) between left-behind children and children of non-migrating parents (**Figures 3c and 3d**). Heterogeneity varied across nutrition outcomes (I^2 0.0-98.1%), with all but wasting and weight-to-height z-score showing significant heterogeneity between studies.

Subgroup analyses of wasting for children left-behind by one parent and by both parents, showed no statistical evidence of an increased risk in left-behind children. Subgroup analyses of stunting revealed a significant increase in risk for children left-behind by one parent and children left-behind by both parents, compared to children of non-migrating parents. Children left-behind by internally-migrating parents had a higher risk of stunting but all other nutrition outcomes remained unchanged. Only three studies reported nutrition outcomes for children left-behind by internationally-migrating parents. Overall no difference was found (**Appendix 43**). Excluding studies at high risk of bias did not alter nutrition outcomes. Using a fixed effects model resulted in significantly worse height-for-age (SMD -0.23 (95% CI -0.29, -0.17)) and weight-for-age (SMD -0.19 (95% CI -0.25, -0.12)) z-scores among left-behind children; all other outcomes remained unchanged (**Appendix p59**).

Other outcomes

Left-behind children had a marginally higher risk of substance use (RR 1.24 (95% CI 1.00-1.52)) including alcohol, smoking and 'any' substance use. There was no statistical evidence of a significant difference in risk of unintentional injury (RR 1.32 (95% CI 0.97-1.78)), experience of abuse (RR 1.09 (95% CI 0.88-1.35)) or diarrhoea (RR 0.97 (95% CI 0.90-1.05)) (**Figure 3e**). Statistical heterogeneity was high across these outcomes (I^2 82.8-83.1%). For substance use outcomes in children left-behind by one parent and children of international migrants, the pooled risk showed no statistical evidence of elevated risk, though each subgroup included only two studies (**Appendix p43**). When studies at high risk of bias were

excluded, we found no statistical evidence of a difference in risk of substance use among left-behind children compared to children of non-migrant parents. Fixed effects meta-analysis revealed a higher risk of unintentional injury among left-behind children (RR 1.35 (95% CI 1.21-1.52)) (**Appendix p 59**). No studies included in the meta-analysis reported outcomes for infectious disease (except diarrhoea) or outcomes for unprotected sex or early pregnancy.

Meta-regression

Meta-regression showed no significant effect of children's gender or mean age on any outcomes (**Appendix p 66**).

Discussion

This systematic review and meta-analysis represents the largest and most comprehensive assessment of the health consequences of parental migration on left-behind children and adolescents to date. Although the majority of studies identified by our review focused on internal labour migration in China, our findings suggest that, as a group, left-behind children and adolescents have worse outcomes compared to their peers, especially in terms of mental health and nutrition. Compared to children of non-migrants, left-behind children and adolescents had a 52% increased risk of depression, 70% increased risk of suicidal ideation and 85% increased risk of anxiety. We found smaller increases in risk for wasting (13%), stunting (12%) and substance use (24%). There was no evidence that left-behind children and adolescents are at greater risk of conduct disorders, overweight and obesity, anaemia, unintentional injury, diarrhoea or abuse. Although a minority of individual studies reported beneficial health effects, no overall benefits were found across any of the outcomes assessed. We found no studies investigating the impact of forced migration, though leaving children behind in the context of conflict or disaster is unlikely.

We updated the searches from 28 April 2017 to 5th September 2018, using the same search terms and databases. This yielded nine further papers (six published in English and three in Chinese), all of which focused on internal migration and were conducted in China. Findings

from the studies were in line with results from our meta-analyses and provide no evidence of benefits of parental migration for left-behind children and adolescents and support our overall findings in terms of the negative health impact on left-behind children and adolescents. Four reported outcomes for depression: three found a small increase in depression symptoms or worse depression scores among left-behind children and adolescents¹³²⁻¹³⁴ and one found no difference.¹³⁵ Studies reporting outcomes for anxiety similarly found increased risks among left-behind children and adolescents.^{132,136} In keeping with our findings, a large study from China (n=13,952) of suicidal attempts found an increase in left-behind adolescents (3.75% in left-behind adolescents versus 2.86% in not left behind, $p<0.01$).¹³⁷ Two studies assessed nutrition outcomes. A cohort study found that left-behind children and adolescents had lower weight- and height-for-age z-scores at baseline and follow-up after migration, though the effect of migration varied by which parent migrated.¹³⁸ Li et al found that a higher proportion of left-behind children were stunted and wasted compared to those whose parents did not migrate.¹³⁹ One study reported a higher risk of any type of unintentional injury (for example vehicle and traffic injuries and falls) among left-behind children and adolescents (adjusted odds ratio of 1.208, $p<0.05$).¹⁴⁰

Labour migration is a global trend, shaping families and communities across the world.¹⁴¹ Our findings are in line with previous reviews concerning left-behind children in rural China and the Philippines^{5,11}: although parental labour migration may have economic benefits for families, it could have hidden costs for the health of children and adolescents left behind. Studies have reported that these negative health consequences extend to other family members. The Child Health and Migrant Parents in South-East Asia (CHAMPSEA) study showed that left-behind mothers and other carers in transnational migrant households were more likely to experience poor mental health than carers in non-migrant households: mental health problems were associated with infrequent contact with the migrant, lack of remittances, and migrant destinations in the Middle East.¹⁴² Beyond age and gender, we were unable to investigate factors mediating poor health outcomes among left-behind children and adolescents, though family structure, community social capital, living conditions and level of

caregiver supervision may play a role.^{71,143} Future research should consider the circumstances of parental migration. Children of parents migrating due to extreme poverty, disasters or oppression are likely to have worse health outcomes compared to children from wealthier migrant families with financial stability and access to adequate healthcare. Residing with siblings and the relationship between child and caregiver could also be important.

Eighty-two percent of studies in our review were from China, an upper middle-income country where migration is mainly internal, oscillatory, rural-to-urban labour migration. Our study highlights a major research gap in countries beyond China, potentially limiting the generalisability of our findings to other forms of migration and to other settings, especially low-income countries. Subgroup analyses in the rest of the world, showed no difference in outcomes for left behind children and adolescents, however, with the exception of conduct disorder, there were few studies, limiting the conclusions that can be drawn.

Addressing the needs of left-behind families will be essential for healthcare workers and policy makers.¹⁴⁴ In China the health and wellbeing of children left behind is a priority and steps are being taken to address this. In 2013, the Chinese government called on local authorities to take specific responsibility for the education and care of left-behind children.¹⁴⁵

The Chinese Women's Federation has taken a lead in most provinces, but action has been very patchy and it is unclear whether the health of left-behind children is improving as a consequence. Community-based children's clubs have been implemented to provide left-behind children with educational and recreational opportunities.¹⁴⁶ Other strategies include conditional cash transfer schemes for caregivers to encourage them to attend health education sessions, vaccinations and health checks.¹⁴⁷ In China until recently, the national household registration (*hukou*) system limited rural children's access to urban health and educational services, with children forced to attend designated migrant schools, which varied in quality. The situation is now changing, especially in smaller cities, with hukou restrictions being relaxed, migrant children attending mainstream schools and using rural health insurance to access healthcare. This has led to an increase in numbers of children now accompanying their parents.¹⁴⁸

Next steps require a multi-faceted approach, involving clinical, epidemiological, intervention and policy perspectives (**Panel 1**). Focusing on all levels of society, the International Organization for Migration recommends a ‘multidimensional intervention framework’ that includes the government and business. Clinicians, teachers and others working with left-behind children and adolescents must be vigilant to the potential mental health and nutritional needs of this population, and be trained to support and treat them. This is especially so for common mental disorders and risky behaviours that children or adolescents may not present with, or may be underlying another clinical presentation. Global mental health initiatives should be encouraged to incorporate a focus on left-behind children. However, a one-size-fits-all approach to intervention is likely to be ineffective since left-behind children and adolescents will have different experiences of migration and being left behind. A study in China found that children currently left-behind had more depressive symptoms regardless of whether they had previously migrated or not. While children who were previously left-behind but now living with their parents had lower levels of depression than rural children without any experience of migration or being left-behind.⁷¹ Although gender was not a predictor of health outcomes among left-behind children and adolescents in our study, girls and boys may require different intervention approaches and content. Interventions are also needed to support caregivers, many of whom may be elderly relatives and have health needs of their own. Increasing the evidence base beyond China is essential, as are longitudinal studies to explore long-term effects of parental migration on children and adolescents. Although familial separation is acutely detrimental for health, children may go on to develop resilience and have potentially better health outcomes.

The strength of this review is its comprehensive scope, drawing upon evidence across all LMICs, in all languages, across multiple health outcomes and with minimal evidence of publication bias. There are also several limitations. Our searches were conducted up to April 2017 and new studies may alter the conclusions. However, when updating the searches till September 2018, the studies were in keeping with our findings. We report high levels of statistical heterogeneity in the meta-analyses, which persisted in subgroup analyses and meta-

regression. This suggests that, despite our use of a strict definition of left-behind children and adolescents, other mediating or moderating factors may influence the results reported in individual studies, including caregiver and contextual factors. Similarly high levels of heterogeneity were found in a systematic review and meta-analysis of mental disorders among refugees resettled in Western countries.¹⁴⁹ Most of the studies we included were cross-sectional and therefore the temporal causal inference is limited. Despite these limitations, our study defines and identifies a global population of young people at risk.

In summary, left-behind children and adolescents have substantial unmet mental health and nutritional needs that have not been well described beyond China. In a world where labour migration is increasingly the norm, interventions that support these young people are urgently needed to prevent long-term negative effects on their health and development.

Word count: 3881/3500

Panel 1: Next steps and future research

Future research and next steps

- Clinical: Healthcare providers should have a higher index of suspicion with respect to mental health and nutritional disorders when dealing with left-behind children and adolescents. More focus should be placed on research to better understand the health needs of this group in a range of countries globally.
- Epidemiology: Increase in the evidence base and available data to understand the short- and long-term health consequences of migration on left-behind children, with a particular focus on internal migration outside of China and international migration, elucidating the mechanisms by which being left-behind may lead to improvements or worsening health. To do this, more work is needed on the moderating and mediating factors, for example the number of parents migrating,

the type and duration of migration, the degree of contact with parents, or age of the children and the differing family situations, including alternate family structures.

- Intervention research: Moving beyond understanding the problem, interventions are needed to improve the health or to mitigate the adverse effects of being left-behind.

This may involve community actions, laws or technology to improve the connectedness of families. Research is particularly needed on interventions at an individual or community level to promote resilience and enable young people to overcome the negative aspects of parental absence due to migration.

- Policy: Both global and national policies need to consider the health needs of children left-behind. Research is needed to identify and implement national policies to provide services for children who may not have parental support. Globally, policies for migrant workers should consider the impact on their families. Migrant workers must be allowed the time to visit and communicate with their families. Global mental health initiatives need to better consider this excluded group.

Figure Legend

Figure 1. PRISMA diagram

*Some studies included more than one outcome

Figure 2. Harvest plot showing all studies included in the review

Figure 3. Forest plots showing (a) mental health binary outcomes, (b) mental health continuous outcomes, (c) nutrition binary outcomes, (d) nutrition continuous outcomes, and (e) substance use, abuse and injury outcomes.

Contributors

KC, DD, GF and TH conceptualised the study and developed the protocol. KC, BE, DD and DK developed the search strategy. BE carried out the search strategy. KC, GF, CZ, LKB, YZ, HS, BE, ARB, WL, MO, DK and DD screened titles, abstracts and full-texts. GF, CZ, LKB, YZ, AM, HS, BE, RB, WL, MO, KR and OM-A carried out data extraction and quality assessment. GF and CO conducted the data analysis. GF, LKB, AM, HS, DK, RB, CO, KC and DD worked on data interpretation. GF, KC, LKB, SH and DD developed the first draft of the manuscript. All authors reviewed, edited and approved the final manuscript.

Declaration of interests

SH is a Senior Editor at The Lancet Infectious diseases. All other authors declare no competing interests.

Acknowledgments

The study was funded by the Wellcome Trust (209993/Z/17/Z). DK is an ESRC postdoctoral fellow. DD receives salary support from NIHR. TH holds an ESRC grant for an intervention for Left Behind Children in China ES/L003619/1. We are grateful to Heather Chesters for her advice on the database search strategies.

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